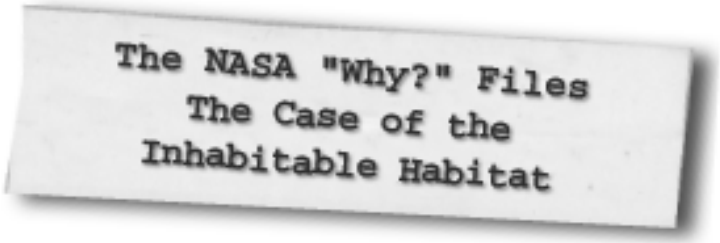


Segment 4

As the tree house detectives put the final touches on their habitat model, they realize that the tree house has become a little messy. Looking at the mess, they wonder what they should do with trash in space. They contact Lisa Polanski, a researcher at NASA Johnson Space Center in Houston, Texas, who explains how astronauts follow the 3 R's in space and what happens to the trash that cannot be recycled or reused. Kali continues on her search for the answer to the fish problem and contacts a classroom at Burbank Middle School in Houston, Texas to learn about the migration patterns of sea turtles. The class explains the Signals of Spring project, and they direct Kali to her next contact. As the tree house detectives visit Dr. D to show off their model, Kali contacts the Virginia Marine Science Museum in Norfolk, Virginia and finally discovers the answer to the fish problem. Once again, Jacob and Kali are back on the beach fishing, but Jacob thinks the fish still haven't returned. After looking at Kali's full stringer, he decides that his just got away!

Objectives

The students will

- learn how trash is disposed of in space.
- understand that recycling is important both in space and on Earth.
- understand the migration of animals.
- understand the significance of a harmful algal bloom.

Vocabulary

algal bloom - a naturally-occurring, higher than normal concentration of the microscopic algae Karenia brevis, that produces a toxin that affects the central nervous system of fish so that they're paralyzed and can't breathe

equilibrium - a state of balance between opposing forces or actions

migration - to pass from one region or climate to another, usually on a regular schedule for feeding or breeding

toxic - relating to or caused by a poison or toxin

toxin - a complicated substance produced by a living organism that is very poisonous when it directly enters the tissues

Video Component

Implementation Strategy

The NASA "Why?" Files is designed to enhance and enrich the existing curriculum. Two to three days of class time are suggested for each segment to fully use video, resources, activities, and web site.

Before Viewing

1. Prior to viewing Segment 4 of *The Case of the Inhabitable Habitat*, discuss the previous segment to review the problem and what the tree house detectives have learned thus far. Download a copy of the Problem Board from the NASA "Why?" Files web site and have students use it to sort the information learned thus far.
2. Review the list of questions and issues that the students created prior to viewing Segment 3 and determine which, if any, were answered in the video or in the student's own research.
3. Revise and correct any misconceptions that may have been dispelled during Segment 3. Use tools located on the web, as previously mentioned in Segment 1.
4. Focus Questions - Print the questions from the web site ahead of time for students to copy into their science journals. Encourage students to take notes during the show so they can answer the questions.

View Segment 4 of the Video

For optimal educational benefit, view *The Case of the Inhabitable Habitat* in 15-minute segments and not in its entirety.

After Viewing

1. At the end of Segment 4, lead students in a discussion of the focus questions for Segment 4 and record answers.
2. Have students discuss and reflect upon the process that the tree house detectives used to learn about Mars and creating a habitat.
3. Choose activities from the educator guide and web site to reinforce concepts presented in the segment. The variety of activities is designed to enrich and enhance your curriculum.
4. Discuss the tree house detectives' final habitat model and create a list of any suggestions for changes or ideas for inclusions. Determine if the tree house detectives needed to research an area or topic more thoroughly before they created their final design. Discuss the suggestions.
5. Complete the Problem-Based Learning activity on the web site.
6. Have students write in their journals what they have learned about Mars, habitats, and/or scientific inquiry.

7. If a class habitat contest was held, have students present their final product. Invite parents and other classes to view the displays and models. You may want to invite engineers, science teachers, or other professionals to judge the habitats to determine a winner. For additional help, visit the NASA "Why?" Files web site for information on the mentoring program offered by AIAA.

Resources

Books

Cole, Joanna: *The Magic School Bus on the Ocean Floor.* Scholastic, Inc., 1992, ISBN: 0590414313.

Gazlay, Suzy: *Field Detectives: Investigating Playground Habitats.* AIMS Education Foundation, 1998, ISBN: 1881431746.

Mercier, Sheryl and Evalyn Hoover: *Exploring Environments.* AIMS Education Foundation, 1999, ISBN: 1881431770

National Wildlife Federation: *Diving into Oceans (Ranger Rick's Nature Scope).* Learning Triangle Press, 1998, ISBN: 0070470979.

Web Sites

The Bridge: Ocean Sciences Education Teacher Resource Center
This resource from the Virginia Institute of Marine Science provides teachers with a selection of the best online resources for marine science education. Discover how marine scientists track fish and link to real time data that can be used in your own investigations.
http://www.vims.edu/bridge/

Signals of Spring
Meet the turtle watch scientist, view real time data from NASA and NOAA, learn how to participate in one of the migratory projects, and link to hundreds of web sites on everything from phytoplankton to ospreys.
http://www.signalsofspring.com/

Sea Turtle Survival League
At this web site, you can learn about current sea turtle tracking projects, discover more about sea turtles, and even adopt one of your own. There are great educational materials, games, and even a free educator's guide.
http://www.cccturtle.org/sat1.htm

NASA Johnson Space Center Kids Shortcuts
Come browse through the various links to learn more about working, living, and exploring space.
http://www.jsc.nasa.gov/pao/students/

NASA's Human Space Flight Web
This comprehensive web site features current and historical information about NASA's human space flight program.
http://spaceflight.nasa.gov/

NASA Kids Liftoff to Space Exploration
This comprehensive web site has everything you need to learn about space. Discover how astronauts live and travel in space. See a simulation and explanation of a shuttle launch, play games, download coloring pages, and join scientists by participating in real science projects! It even has a teacher section for some great resources.
http://kids.msfc.nasa.gov/

The Harmful Algae Page
Learn what causes algae to bloom and why they are toxic to fish, other sea animals, and even to people.
http://www.redtide.whoi.edu/hab/

Texas Parks and Wildlife: FAQ About Red Tide
Great explanations to those frequently asked questions about a red tide. Learn if it is safe to swim in a red tide and whether or not you should eat the fish caught during a red tide. A link to a Spanish translation is also provided.
http://www.tpwd.state.tx.us/fish/recreat/redtide.htm

Careers

ichthyologist
marine biologist
aquarium curator
underwater filmmaker
baykeeper
environmental lawyer
chemical oceanographer
aquatic chemist
wildlife biologist
ecologist
exobiologist

Activities and Worksheets

Trash That Survey

Approximately 160 million tons of trash are generated by society each year. That is a lot of garbage! The average family produces three to four pounds of garbage each day. That is a 100 pounds a week or over 5,200 pounds each year. Ninety percent of that is simply dumped into landfills, but over 50 percent of the garbage we create is recyclable. The cost alone of creating, opening, and closing just one landfill is approximately one million dollars. Not only are landfills expensive to operate, but the trash that goes into them takes a long time to biodegrade or decay. For example, if the Pilgrims had used aluminum cans at the first Thanksgiving, the cans would still be around today! An aluminum can will litter the Earth for up to 500 years!

Survey your parents, grandparents, and friends to find out what goes into their garbage cans each week. Put a tally mark beside each item that is thrown away. Add the tally marks and graph your results

TRASH	TALLY MARKS	TRASH	TALLY MARKS
Newspaper		Egg carton	
Glass jars/bottles		Paper bags	
Plastic containers		Styrofoam®	
Disposable diapers		Food waste	
Cardboard		Aluminum foil	
Aluminum cans		Tin cans	
Old clothes		Yard waste	

Conclusion

1. Which of the above items could be recycled?
2. If everyone recycled all possible items, how would it help our Earth?

Extensions

1. Research composting and start a compost pile.
2. Look at several items bought from a store and discuss the way they are packaged. Is there a better way that will create less trash?
3. Read *Just a Dream* by Chris Van Allsburg and discuss what makes Walter change his wasteful ways.
4. Learn more about Earth Day and plan a celebration of your own.
5. Create a "trash creature" using various items found in your garbage.
6. Conduct research on landfills and present a report.

Where Have All the Turtles Gone?

Problem

To understand that animals migrate

Materials

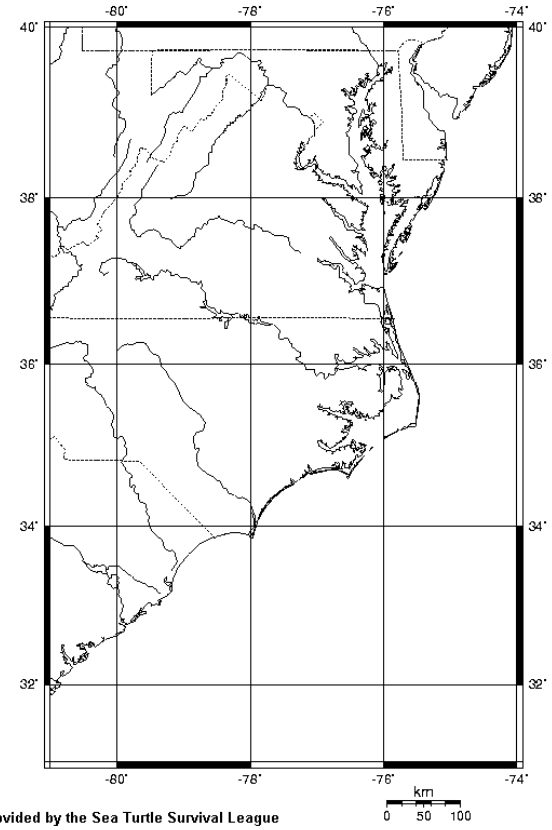
map
8 colored pencils
turtle data

Procedure

1. Review latitude and longitude and how to plot coordinates.
2. Review the turtle data and assign a different colored pencil for each month of data given.
3. Color in map key to correspond to the colors chosen.
4. Using the appropriate color, plot the coordinates for that month.
5. After plotting all the points, look at the path the turtle traveled. What conclusions can you draw about the migratory patterns of this turtle?
6. Research information on the ocean currents. Use maps and other reference sources to locate the position of ocean currents in this area and lightly color them on the map.

Sea Turtle Data

Date	Latitude	Longitude
7/15	33.2 N	79.1 W
7/28	33.4 N	78.3 W
8/1	33.7 N	77.5 W
8/1	33.6 N	77.2 W
8/3	33.7 N	77 W
8/5	33.9 N	76.5 W
8/9	35.0 N	75.5 W
8/10	35.2 N	75.9 W
9/14	38.9 N	74.7 W
11/9	34.0 N	76.7 W
11/30	32.5 N	78.8 W
12/3	32.0 N	79.3 W
12/6	31.6 N	79.6 W
12/11	31.5 N	79.7 W
12/12	31.6 N	79.6 W
1/3	31.5 N	79.7 W
1/17	31.2 N	79.4 W
1/23	32.0 N	79.3 W
2/15	31.8 N	79.4 W
2/21	31.4 N	79.7 W
3/21	32.1 N	79.4 W



Provided by the Sea Turtle Survival League

Key

July		Dec.	
Aug.		Jan.	
Sept.		Feb.	
Nov.		Mar.	

Fishing for Fish

Problem

To observe and track the movement of fish in an aquarium

Materials

10 gal aquarium with 3-4 different fish
clear plastic or acetate
different colored dot stickers or
different colored permanent markers
scissors
metric ruler
timer or clock with second hand
science journal
clear tape

Procedure

1. Measure the length, width, and height of the aquarium's front glass wall and record in your science journal.
2. Using these measurements, cut 3-5 sheets of acetate or clear plastic.
3. Place one of the sheets over the glass wall of the aquarium and secure in place with clear tape. See diagram 1.
4. Assign a different colored dot or colored marker for each fish.
5. In your science journal, create a key denoting the colors.
6. Focus on the fish and watch their movements for a few minutes.
7. Set the timer for 5 minutes, and every 30 seconds mark the position of each fish with the coordinating dot or marker. See diagram 2.
8. At the end of the 5 minutes, take the sheet of plastic off the aquarium and write the date and time on the sheet in the left corner. Set it aside.
9. At the same time each day for 4 days repeat steps 3-8.
10. At the end of your observations on the fifth day, lay each sheet on top of the other in order of date, with the first day on the top.
11. Compare all the sheets to see how the paths of the fish differ each day.

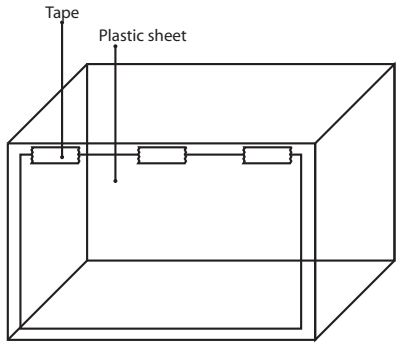


Diagram 1

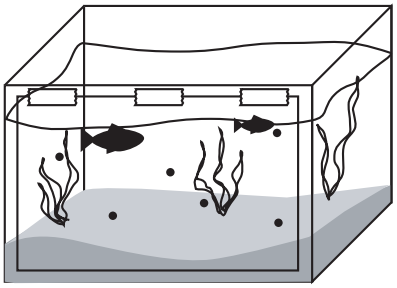


Diagram 2

Conclusion

1. Did the fish in the aquarium seem to hang out in certain places?
2. If so, why did they do that?
3. What variables were you able to control in this experiment? What variables were you unable to control? Would control of variables make a difference in your results?
4. Is there another way you could more accurately track your fish?

Bloomin' Algae

Problem

To learn the effect that fertilizer has on algae population in ponds and lakes

Materials

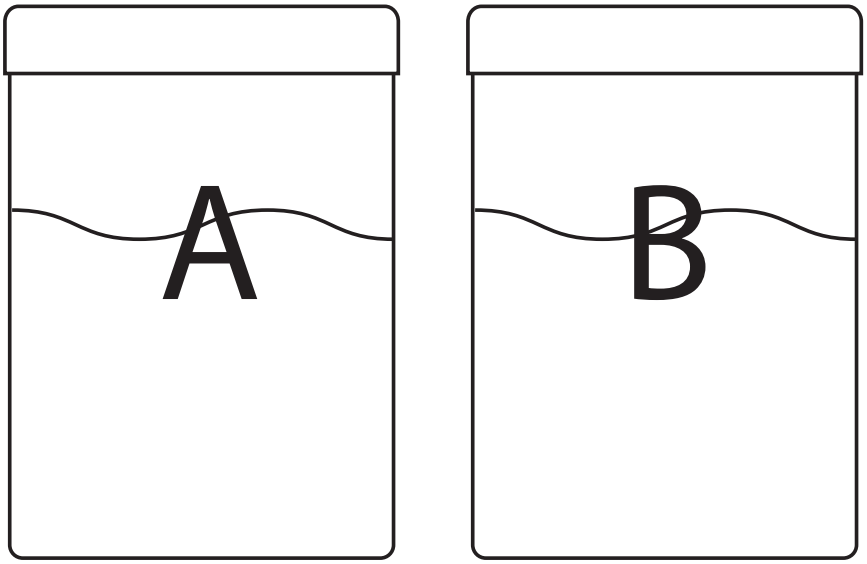
2 glass jars with lids
aged tap water
aquarium or pond water
graduated cylinder
liquid fertilizer
permanent marker
science journal

Procedure

1. Using the permanent marker, label the two jars A and B.
2. Fill each jar half full with tap water that has been allowed to stand for 3-5 days.
3. Add aquarium water to each jar until the jars are three-fourths full.
4. To jar A, add 5 ml of liquid fertilizer.
5. Place the lids on the jars and place them in an area where they can receive direct sunlight.
6. Each day for two weeks, observe the jars and record your observations in your science journal.
7. Compare the color of the water in each jar and record your observations.
8. Color the water in the picture below to match the color of the water in your jar.

Conclusion

1. In which jar did more algae grow? How can you tell?
2. What was the purpose of jar B in this experiment?
3. How would fertilizer get into lakes, ponds, or rivers?
4. What would happen if a large amount of fertilizer went into a lake or pond?
5. How would an algal bloom in a lake or pond kill the fish? Is it the same as an ocean algal bloom?



Tracking Fishy Words

Using the word bank, find each word and circle or highlight the word once found.

M I G R A T I O N B O D E N H A
T S I E D K C C C H H D M I H H
A T D V S U T T M E P A R A E A
K L A K Y U F A R D A C B H W B
D F E F G A I H Z S T N I C M I
D X O Z D F S E A T R S L D A T
R V C O B N H E G K H E U O E A
E N E H D T O H B L O O M O R T
Z T I F H W C V U L M H R F T R
I U C M E S E A T U R T L E S F
L Q W I O P U B M U O N W R F L
I U A L G A E B E G K A E J L N
T E O L F H N S G C T I P E U R
R K H Y G H K M O F N O S G G P
E H A E H M G H W U L C J T G N
F O G U D L O G G E R H E A D E

Word Bank

migration
algae
bloom
fish
habitat
food web
sea turtles
food chain
fertilizer
loggerhead
ocean
Gulf Stream

Answer Key

Trash that Survey

1. All the items are recyclable, but most communities only recycle glass, aluminum, paper, plastic, and tin. Clothes can also be donated to a charity so that they can be worn by someone else.
2. Recycling would greatly reduce the number of landfills we would need. It would also reduce pollution, and save the Earth's natural resources.

Fishing for Fish

1. Answers will vary, but sometimes fish do have certain places they like better than others.
2. Some areas of the tank may offer more safety for the fish or it could be a warm or cold spot in the tank that the fish prefers.
3. Answers will vary but might include observing the fish at the same time each day and keeping the temperature of the water constant with an aquarium heater. Yes, because variables that are not controlled and held constant can invalidate an experiment.
4. Answers will vary.

Bloomin' Algae

1. Jar A because of the color of the water.
2. Jar B was the control jar for the experiment.
3. To make crops and yards grow greener and more plentiful, farmers and homeowners use fertilizer. However, when it rains the fertilizer washes off, and the fertilized water then runs into ponds, streams, or rivers. The rivers then carry the water into the lakes.
4. It would provide food for the algae and the algae would begin a rapid period of growth.
5. The fertilizer acts as a food source for the algae, and with extra food, the algae population explodes. If the increase in algae is very large, it can be harmful to fish because the algae will use many important nutrients and oxygen that the fish need. In the ocean, Alexandrium cysts can cause a harmful algal bloom. These cysts can lay dormant on the ocean floor for many years. Once these are stirred up and the conditions are right (warmer weather with lots of sunlight), the cysts begin to germinate. These are toxic to fish and many fish may die.

Tracking Fishy Words

M I G R A T I O N B O D E N H A
T S I E D K C C C H H D M I H H
A T D V S U T T M E P A R A E A
K L A K Y U F A R D A C B H W B
D F E F G A I H Z S T N I C M I
D X O Z D F S E A T R S L D A T
R V C O B N H E G K H E U O E A
E N E H D T O H B L O O M O R T
Z T I F H W C V U L M H R F T R
I U C M E S E A T U R T L E S F
L Q W I O P U B M U O N W R F L
I U A L G A E B E G K A E J L N
T E O L F H N S G C T I P E U R
R K H Y G H K M O F N O S G G P
E H A E H M G H W U L C J T G N
F O G U D L O G G E R H E A D E

ON

THE WEB

Garbage Anyone?

1. Answers will vary depending on the trash selected.
2. Various items will decompose or biodegrade at different rates. For example, aluminum cans, glass bottles, disposable diapers, and plastic containers can take up to 500 years, but some paper will decay after only 4 weeks. Tin cans take only 100 years to decompose.
3. One reason is because we are running out of space for landfills so the less trash we have to bury, the longer the current landfills will last. Landfills can also pose a harmful threat to our ground water supply; therefore, we want as few as possible.
4. It could be, but it would not be very cost effective. It would be very expensive to bring dirt into space to bury trash!
5. As astronauts go into space for longer periods of time, trash becomes an important issue. NASA must find ways to reduce and eliminate trash because they won't have room to store much of it, and it cannot be "thrown" out the door into space!